Community-Directed Intervention and Partnership with Patent Medicine Vendors in Malaria Control Booster Project (MCBP) Implemented by Federal Government of Nigeria and The World Bank

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Table of Contents

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Disclaimer:

I am solely responsible for this work, and will be fully responsible for the content of the paper.

List of Acronyms

ACT	Artemisinin Combination Therapy
CDD	Community-Directed Distributor
CDI	Community-Directed Intervention
CMD	Community Medicine Distributors
CHW	Community Health Workers
FGN	Federal Government of Nigeria
HEW	Health Extension Workers
ICCM	Integrated Community Case Management
ITN	Insecticide-Treated Net
PMV	Patent Medicine Vendor
PPP	Public-Private Partnership
RDT	Rapid Diagnostic Test

I. Executive Summary

The Malaria Control Booster Project (MCBP) is part of Federal Government of Nigeria efforts to improve the health situation blighted by preventable and treatable diseases. It contains two main components: i) strengthening the capacity of the Federal Government to provide malaria control leadership and coordination over the medium and long-term; and ii) strengthening the health system to improve delivery of an integrated package of interventions in the target states. (The World Bank, 2010) The project has lasted for over 8 years, from 2007 to 2015. During these 8 years, a number of interventions have been executed to increase the quality and utilization of health services for malaria prevention and treatment. This research will mainly focus on two interventions---Community-Directed Interventions (CDIs) and Public-Private Partnerships (PPPs). The paper will include a background introduction, literature reviews, a detailed description of the two interventions, relevant data, a summary of the interview with the program coordinator, M Abul Kalam Azad, and a discussion on whether CDI and PMV interventions contributed to controlling malaria in Nigeria by analyzing the data

collected from the project.

II. Introduction

The US$180 million World Bank-assisted Malaria Control Booster Project (MCBP) became effective in May 2007 with two main objectives: 1) Ensuring that the target population in project states have access to, and utilize, a well-defined set of Malaria Plus Package interventions; and 2) strengthening Federal- and State-level ability to manage and oversee the delivery of these interventions. (Development Impact Evaluation(DIME), 2014) In June 2009, an additional credit of US$100 million was approved by the World Bank to scale up malaria interventions to universal access level. Along with the additional found, two main interventions, Community-Directed Interventions (CDIs) and Public-Private Partnerships (PPPs), were implemented.

The reason for implementing these two interventions is a combination of severe malaria epidemics in Nigeria and the low use of health services to prevent and treat malaria. Nigeria is one of the countries most affected by malaria. Nigeria accounts for

nearly 25% of global malaria-related morbidity and mortality, far more than any other country. (The World Bank, 2010) The annual economic loss due to malaria is estimated at more than US$800 million, approximately 12% of GDP at the time. (Development Impact Evaluation(DIME), 2014) In addition, the public sector alone is not sufficient to deliver preventive and treatment services. Therefore, the use of main malaria prevention facilities, Insecticide-Treated nets (ITNs), is surprisingly low, which means most people in Nigeria are still unprotected from malaria. The coverage of Rapid Diagnostic Test (RDT) and Artemisinin Combination Therapies (ACTs) is also limited. In this case, the Nigeria government and the World Bank Group decided to work together to adopt community and private sector approaches, aimed at increasing access to prevention and treatment services.

III. Literature Reviews

The literature review part will mainly summarize previous theory studies and real-world experiences on malaria prevention and treatment all over the world. This part will

cover the following areas: a) Previous studies on the most vulnerable population and the specific measures taken to protect them; b) Community-based management experiences. In the past few years, many public health programs have been implemented in developing countries, and community-based management has been widely used and regarded as a relatively effective way to control public health issues. Thus, the literature review part will summarize previous experience on community-based management; c) Patent Medicine Vendors in malaria control. Medicine vendors have been a common source for malaria patients to access antimalarial medicine for a long time in many countries and areas. Thus, some previous studies tried to understand whether it is an effective method to fight against malaria. d) ACT and RDT use in previous malaria prevention and treatment. ACT and RDT have been proved to be effective ways to treat and diagnose malaria, respectively. The literature review part will summarize the experience on ACT and RDT use in previous malaria control programs to see whether they were appropriately used and to what extent they were effective in these programs. For each cited study, the literature review will include three main parts: 1) a brief description of the

study; 2) the purpose of the study; 3) the main study methods and 4) the results of the study.

3.1. Studies on Most Vulnerable Population

A study from WHO identified that Children aged less than five years and pregnant women are the people most vulnerable to dying of malaria or suffering serious consequences of the disease, especially in regions where transmission is intense. (WHO, 2012) Therefore, a number of studies focus on these two special groups of population, trying to understand their health-seeking behaviors and whether they have been protected from malaria in previous programs and projects.

In order to investigate the population-based malaria parasitemia burden during pregnancy and to explore person-level maternal risk factors that are associated with high malaria parasitemia, researchers conducted a study using community-based sampling in Nigeria. 2069 self-identified pregnant women between the ages of 17–45 years were recruited from churches in Enugu State, Nigeria. Malaria parasitaemia was classified as high and low based on the malaria plus system. The results showed that over 99 % tested

positive for malaria parasitaemia, 62 % showed low parasitaemia and 38 % high parasitaemia. The results indicated a high prevalence of malaria parasitemia among pregnant women in Nigeria. Therefore, education on best practices to prevent malaria during pregnancy, and resources in support of these practices are urgently needed. (Gunn, et al., 2015)

A study conducted in Cameroon tried to assesse the level of knowledge and perceptions towards malaria control among pregnant women and mothers/caretakers of under-fives. During this study, a community-based cross-sectional study was conducted in the Buea Health District in August, 2011 in five health areas. A questionnaire was used to collect data on demographic variables, knowledge and perceptions towards malaria control from 443 respondents aged 15–73 years. The results showed that 99% respondents had heard about malaria. Overall, 92% of respondents had the right perception of malaria and 88% knew at least one correct sign/symptom of malaria. The most recognized sign of malaria was fever. When all aspects of malaria were considered, majority (88%) of respondents had good levels of knowledge on malaria. However, only

48% used ITNs for protection against malaria. (Kimbi, et al., 2014)

Other research tries to examine the existence of social interactions in malaria preventive behaviors. A study conducted in Sub-Saharan Africa discussed whether an individual's social environment has an influence on the individual's preventive behaviors, with a focus on the most vulnerable groups of population, children under 5 years old and pregnant women. The research defined preventive behaviors as sleeping under a bednet and taking intermittent preventive treatment during pregnancy. It also defined the social environment of the individual as people living in the same region. The data came from 92 surveys for 29 Sub-Saharan countries between 1999 and 2012, and they covered approximately 660,000 children and 95,000 women. The research results indicated that there were social interactions in malaria preventive behaviors in the form of social multipliers effects of women's education and household wealth. The long-run effects of these characteristics on preventive behaviors at the regional level were larger than those apparent at the individual level. (Apouey & Picone, 2014)

3.2. Community-based case management experiences

Community-based case management has been recognized as an effective way to control various diseases. The following studies will give examples on how community-based interventions are implemented in different countries and areas all over the developing world. Some of the them will also focus on the effectiveness, achievements and problems of community-based management.

In Uganda, community services for febrile children started to include treatment for malaria, diarrhoea and pneumonia through Integrated Community Case Management (ICCM). To understand the level of support available, and the capacity and motivation of community health workers to deliver these expanded services, a study interviewed community medicine distributors (CMDs). Between October 2009 and April 2010, 100 CMDs were recruited to participate by convenience sampling. The survey included questionnaires to gather information about the CMDs' work experience and to assess knowledge of fever case management, and in-depth interviews to discuss experiences as CMDs including motivation, supervision and relationships with the community. The results showed that CMDs described being motivated to volunteer for altruistic reasons;

however, the main benefits of their work appeared related to ‘becoming someone important’, with the potential for social mobility for self and family. At the time of the survey, over half of CMDs felt demotivated due to limited support from communities and the health system. The researchers suggested that if community interventions are to become the solution to improving access to primary health care, greater attention to what motivates individuals, and ways to strengthen health system support are required. (Banek, et al., 2015)

Another study, which was also conducted in Uganda, tried to describe the current situation of community-based intervention. Instead of focusing on community medicine distributors (CMDs), this study aimed to evaluate the performance of community health workers (CHWs) in Uganda. It compared the performance of CHWs managing malaria and pneumonia with performance of CHWs managing malaria alone in eastern Uganda and the factors influencing performance. A mixed methods study was conducted among 125 CHWs providing either dual malaria and pneumonia management or malaria management alone for children aged four to 59 months. Performance was assessed using

knowledge tests, case scenarios of sick children, review of CHWs' registers and focus group discussion with CHWs. The results showed that the following factors largely influenced CHWs' performance: community support and confidence, continued training, availability of drugs and other necessary supplies, and cooperation from formal health workers. (Kalyango, et al., 2012)

Similarly, studies conducted in other countries also talked about community-based case management. Ethiopia scaled up integrated community case management of childhood illness (iCCM) in most regions, and a study was to assessed the strength of iCCM implementation and the quality of care provided by health extension workers (HEWs). The study conducted a cross-sectional survey in the two study zones, the iCCM intervention area and the comparison areas. Intervention areas received the iCCM program, whereas comparison areas continued with the pre-existing routine CCM program. The study drew the following conclusions: Firstly, iCCM has largely been implemented as planned in the study areas. Secondly, HEWs in iCCM intervention areas performed most basic assessment tasks and correctly managed nearly two-thirds of all

children, with minimal over-prescription of drugs. Despite these achievements, only about one-third of children with severe illness were correctly managed. Few children accessed care from HEWs, and virtually no children under 2 months of age, the age group with the highest risk of mortality, were seen. (Miller, et al., 2014)

3.3 Patent Medicine Vendors (PMVs) in malaria control

Besides Community Health Workers, the Patent Medicine Vendors are also believed to play a role of great importance in controlling malaria. Previous studies have tried to discuss whether the PMVs can be an effective method to fight against malaria.

A research conducted in Jigawa, Nigeria tried to use Lot quality assurance sampling (LQAS) to monitor and evaluate PMV practice. A two-stage LQAS assessed whether at least 80% of PMV stores in SDs used national treatment guidelines. Acceptable sampling errors were set in consultation with government officials (alpha and beta <0.10). Unfortunately, they found that the PMVs performed poorly in all SDs of Jigawa, Nigeria, including storing and recommending ACT. In addition, most PMVs lacked training on providing appropriate treatment to malaria patients. Therefore, the

study conclude that There was urgent need to regularly monitor and improve the availability and quality of malaria treatment provided by medicine sellers in Nigeria. (Berendes, et al., 2012)

Another more recent study also focused on PMVs in Nigeria. The research tried to explore whether the PMVs provided appropriate medicine for children with malaria. The research conducted a census of 250 PMV shops in Kogi and Kwara states in Nigeria. Multivariate regression analysis was used to assess associations between shop worker characteristics and (1) knowledge of optimal treatments for malaria, diarrhoea, and pneumonia, and (2) stocking of essential medicines to treat these illnesses. From the census, they found that most shops stored anti-malaria medicine. From the regression results, they found that selling drugs wholesale and participating in any training in the past year was associated with a higher likelihood of naming the correct treatment for malaria. (Treleaven, Liu, Prach, & Isiguzo, 2015)

3.4. ACT and RDT use in malaria prevention and treatment

WHO suggested that patients with suspected malaria should have parasitological

confirmation of diagnosis with either microscopy or rapid diagnostic test (RDT) before antimalarial treatment is started. Moreover, WHO also recommends artemisinin-based combination therapies (ACTs) for the treatment of uncomplicated malaria caused by the P. falciparum parasite. (WHO, 2015) Thus, many malaria control programs have used RDT and ACT as recommendations given by WHO for malaria diagnosis and treatment. In recent years, a number of studies have been conducted to identify the use of RDT and ACT and evaluate their effectiveness.

Studies in some settings have tried to assess the influence of RDTs on the prescribing behavior of health workers, but such information is generally lacking in Nigeria and many parts of sub-Saharan Africa. To provide more information in Nigeria, a study analyzed health workers' perceptions of RDTs and their potential influence on their prescribing and treatment practices after their introduction. The study was conducted in four health centers in Nigeria, where RDTs were deployed. The field workers interviewed 32 health workers who worked in these health centers. Information was sought on their perception of symptoms-based, RDT-based, and microscopy-based malaria diagnoses. In

addition, prescription analysis was carried out on 400 prescriptions before and 12 months after RDT deployment. The study found that the majority of the health workers perceived RDTs to be more effective for malaria diagnosis than microscopy and clinical diagnosis. ACTs were prescribed in 74% of RDT-negative results. The researchers recommended that efforts should be made to encourage health workers to trust RDT results and prescribe ACTs only to those with positive RDT results. (Uzochukwu, et al., 2011)

Another study trying to evaluate the effectiveness of using community health workers (CHWs) as delivery points for ACT and RDTs in the home management of malaria was conducted in two districts in Zambia. The study methods include Diagnostic testing, Pre-packed anti-malarial, Record reviews, Focus group discussion and in-depth interviews, Field observations and Data analysis. The study results showed that 100% and 99.4% of the patients with a negative RDT result were not prescribed an antimalarial in the two districts respectively. No cases progressed to severe malaria and no deaths were recorded during the study period. (Chanda, Hamainza, Moonga, Chalwe, & Pagnoni, 2011)

Overall, the above studies cover 4 aspects: Care-seeking behaviors of most vulnerable population; Community-based case management experience; the role of PMVs in malaria control; and ACT and RDT use in malaria prevention and treatment. These aspects are closely associated with the interventions implemented in Nigeria Malaria Control Booster Project. The following part of the paper will focus on the two interventions in the project---CDI and PMV.

IV. Interventions Description

In 2009, with the additional credit of US$100 million approved, two additional interventions, Community-Directed Intervention (CDI) and Public-Private Partnerships (PPPs) were implemented. The CDI involves selecting and training Community-Directed Distributors (CDDs) on preventive actions, diagnosis using Rapid Diagnostic Test (RDT), and home management of malaria with Artemisinin Combination Therapy (ACT). The PPPs intervention involves training Patent Medicine Vendors (PMVs) – private drug retailers – in symptomatic diagnosis of malaria and the appropriate sale of subsidized

ACTs. (Development Impact Evaluation (DIME), 2014)

V. The process of Interventions Implementation

This part will discuss and analyze the process and results of the CDI and PPP interventions by summarizing the relevant project documents, data and interviews with project manager, M Abul Azad. It contains CDDs/PMVs selection process, training program provided to CDDs/PMVs, and the services provided by CDDs/ PMVs to the community members.

5.1. CDDs/ PMVs Selection

The CDDs/PMVs selection part is mainly based on the summary of the interview with the program coordinator, M Abul Kalam Azad.

To implement the Community-Directed Intervention, the project team firstly selected volunteers from the community as Community-Directed Distributors (CDDs). When selecting CDDs, the first and the most important criterion was sustainability, which meant that the CDDs would stay in the community for a long time. For example, high

school students would not be a good choice because they might move out from the community for a job or higher education in the near future. Similarly, women who might marry out would not be selected, either. The second criterion was whether the person can read and write. There were three main reasons for it: 1) This job would require CDDs to keep records during the whole process; 2) CDDs would receive some training, during which the CDDs need to have some certain level of capacity to absorb the information; 3) The project would require CDDs to have the ability of applying what they would learnt in the training programs into practice, including malaria prevention, diagnoses and treatment. The last criterion was whether the person had relevant experiences. The community-directed intervention was actually introduced in River Blindness Onchocerciasis Project, which was a public health project implemented in Nigeria before the MCBP project. The people who served in the Onchocerciasis Project were preferred in this project, because they had been exposed to similar heath care problems. After the selection was completed, some adjustments were made according to the practical situation. In the end, a total of 4,176 and 1,143 CDDs were selected in Anambra and

Gombe State, respectively. Each PHC catchment area selected up to 30 CDDs.

Meanwhile, the Patent Medicine Vendors (PMVs) were also selected to get involved in the project. However, no criteria were established for this selection. The reason was that the PMVs were not regulated by the malaria project but by their own association. The malaria project cooperated with the association on the PMVs selection. There was a local coordinator from PMV association in each local government area, and it was the coordinator who was responsible for selecting PMVs in this area. There were more PMVs in each political ward but a limited number of PMVs were chosen to work with the project. In the end, a total of 979 PMVs were selected in Anambra State, and 340 PMVs were selected in Gombe State.

5.2. Training Program

To equip the CDDs and PMVs with Artemisinin Combination Therapy (ACT), Rapid Diagnostic Test (RDT) and record keeping register, the project provided a series of Integrated Community Management of Malaria workshops to CDDs and PMVs. The trained program paid great attention to the children under 5 years old and pregnant

women, who were the most vulnerable population. From the contents of training program, we can get to know how the CDDs and PMVs were trained and what they were expected to achieve after the training program. Afterwards, we can have a comprehensive understanding on what problems the MCBP project particularly focused on and tried to address through CDD and PMV interventions. The training program provided by the project to CDDs and PMVs were quite similar, and both of them contained the following 6 modules:

Module 1: Overview of Malaria

At the end of this session, the participants are expected to understand: (a) The importance of malaria. Participants are expected to know the reasons why malaria is a major concern and the current overall situation of malaria in their community; (b) Types of malaria, including Uncomplicated Malaria and Severe Malaria. The Uncomplicated Malaria is usually not life threatening but can proceed to life threatening if not treated immediately. The Severe Malaria occurs when the signs and symptoms are accompanied by one or more life threatening signs. Then, the patients must be referred to the health

facility immediately; (c) Cause of malaria. Participant should know that it is the bite of infected female Anopheles mosquitos that actually causes malaria; (d) How malaria is transmitted. Participants should understand that the infected mosquito introduces germs (malaria parasites) into the bloodstream during blood suck. Then the germs feed on and destroy human red blood cells; (e) Groups most at risk of having severe malaria illness. Participants should know that the following groups of people are the most vulnerable to malaria: children under 5 years old, pregnant women, people with Sickle Cell Anemia, and people from regions where malaria is not a common illness; (f) Wrong things people believe about malaria. For example, many people believe that malaria is caused by drinking palm oil or working too hard. Other people believe that malaria can never lead to death or it will go away even when it is not treated. The participants should find and correct those wrong thoughts about malaria by the end of the session.

Module 2: Malaria Diagnose (RDT)

At the end of this session, participants are expected to know: (a) New National Policy on the management of malaria. The new policy carried out in 2011 recommends

that all suspected fever be confirmed with the use of microscopy in the hospitals or simply with RDTs. However, children under 5 years old with fever or history of fever in the past 24 hours or other symptoms, should be treated for malaria where the disease cannot be confirmed. (b) Importance of diagnosis. The participants should know the fact that some severe fevers due to other conditions have also been treated with malarial medicines, hence the patients cannot recover from their illnesses. Therefore, the patients need to be diagnosed properly before they are treated. (c) Types of diagnosis recommended for malaria, including microscope in the laboratory and RDT. (d) The procedure for the use RDTs to diagnose malaria. Participants need to know each specific step for doing RDT and quality control methods for RDT results.

Module 3: Malaria Treatment

At the end of the session, participants should be able to know: (a) How to treat individuals with malaria. Participants are expected to recognize malaria, bring down the patients' temperature and give anti-malaria medicine. (b) Appropriate medicines and doses to treat malaria. Treatment for uncomplicated malaria is now done with ACTs.

Participants are supposed to give appropriate instructions on when and how to take ACTs as well as best practice if the patient is not getting better. (c) How to recognize danger signs and refer to health facility promptly. Participants are expected to refer the patient to a health facility immediately when the following symptoms occur: There is no improvement after 48 hours; The child is less than 4 months old; The client is a pregnant woman; Any of the danger signs are recognized; The client is not complying with treatment; You are unsure of the nature of the illness or condition; Illnesses other than malaria are present.

Module 4: Malaria Prevention

By the end of the session, participants are expected to know how to take the following prevention measures: (a) Insecticide-Treated Net (ITNs). ITNs have been verified to protect people especially the most vulnerable groups of population from malaria during bed time. Participants should be able to provide instruction on how to hung up ITNs to the household of community members. (b) Environment Management. Participants should know what measures can be taken to destroy mosquitos and their

breeding places. (c) Personal Protection. Participants should encourage community members to use repellent creams, knock-down insecticides, window screen and wear protective clothing such as long-sleeved shirts and long trousers in the evenings to fight against mosquito bites. (d) Intermittent Prevention Treatment (IPT) for Pregnant Women. Participants should be aware that they cannot give medicine to pregnant women by themselves. Instead, they must refer all the pregnant women to the health facilities for IPT.

Module 5: Record keeping & Medicine Storage

By the end of the session, participants are expected to know how to take the following measures: (a) Record Keeping. Participants should record the following information for each client: name, age, address, drug dispensed and dosage, date for follow up, and any remark including outcome of the treatment. (b) Storage of Medicine. Participants should learn to store their medicine appropriately. When storing the medicine, they need to pay attention to the heat, light, humidity and protect the medicine from rats, insects and theft. (c) Preventing Medicine from Expiration. Participants should learn how

to calculate stock requirements correctly and note the expiry date on stock cards. They should distribute drugs and supplies using First Expired First Out method. They are also expected to give excessive stock items to colleagues with faster turnover.

Module 6: Facility visit & Role play

By the end of the session, participants are expected to understand (a) Medicine Arrangement in Stores. Participants are divided into two groups to visit PPMV facilities to observe how the medicine is stored, managed and distributed in stores. (b) Role Play. In this session, participants would practice on convincing a mother to carry out malaria test for her sick child and sending a pregnant woman to access Intermittent Preventive Treatment in the facility through Role Play.

Overall, the above is a detailed description on how the CDDs and PMVs are trained through the training program. It should be noticed that the PMVs differed from CDDs on malaria diagnoses in practice. Despite the fact that both CDDs and PMVs received training on how to use RDT to diagnose the malaria, the Nigeria policy regulated that only the CDDs could use RDT but the PMVs could not. The policy may

have contributed to inaccurate diagnosis provided by PMVs. The PMVs can only diagnose malaria by observing some certain symptoms, such as fever. Therefore, many patients with fever may still get ACT from PMVs even thought they might not have malaria. The project trained the PMVs on how to use RDT in case that the PMVs might have access to it in the future.

5.3. Community Services

After the training program, the CDDs and PMVs provided community services in their assigned communities, mainly including sharing their knowledge with others and organizing their community to carry out antimalarial work. In addition, they also carried out some specific activities at the community level: (a) Promoted awareness of malaria. (b) Promoted prompt treatment of malaria, knowledge of danger signs and early referral. (c) Promoted LLINs use through sales, mobilization, demonstration of use and treatment. (d) Created awareness on IPT and referral of pregnant clients to health facilities. (e) Mobilized community to destroy breeding sites of mosquito. (f) Extended credit facilities to clients. (g) Created and sustained partnerships at community level.

It should be noticed that in practice, there were some difference between the the main responsibilities of CDDs and PMVs. Each CDD was assigned to provide health care for up to 500 community members. CDDs became the health worker in their kindred, providing guidance on malaria prevention, diagnoses and treatment. They served people who were related to them through family ties. The services provided by CDDs include: (1) mobilizing their communities to utilize malaria interventions; (2) providing information to community members on Malaria Prevention and Control Activities; (3) conducting home visits and providing selected malaria services during the visits; (4) referring clients for treatment of malaria or any other illnesses at the health facilities within their communities; (5) keeping records on malaria prevention and control activities in the communities; and (6) managing malaria commodities supplied for their community use.

The PMVs were assigned to distribute public subsidized ACT and reach out to the zonal store to refill their stock once they ran out.

VI. Interventions Results

The World Bank has conducted an impact evaluation to determine the causal impact of policy innovations. The evaluation uses a cluster-randomized experimental design. There are 4 study arms, each comprising an average of 86 Primary Health Facilities and 71 wards per state: 1) Treatment1: CDI intervention only; 2) Treatment 2: PPP intervention only; 3) Treatment 3: Both CDI and PPP intervention; 4) Control group, which only contains existing public-sector regime. The Malaria Control Booster Project carried out in 7 states in Nigeria, including Akwa Ibom, Anambra, Bauchi, Gombe, Jigawa, Kano and Rovers. The evaluation was conducted in two of the states---Anambra and Gombe. This paper will only evaluate the programs implemented in Anambra State because the data on Anambra State was available first. The data were collected at baseline and then again collected approximately one year later. By comparing the data from baseline and follow-up, we can find whether the malaria situation in Nigeria was moving to the right directions during the process of the program.

The data used in the paper will only be collected from Anambra Baseline Report

and Anambra Follow-up Report. The paper will conduct descriptive analysis from the following aspects: (1) To what extent the CDDs and PMVs knew about malaria; (2) Whether CDDs and PMVs diagnosed malaria appropriately; (3) Whether CDDs and PMVs treated malaria appropriately; (4) To what extent the community members knew about malaria; (5) Whether the community members took appropriate malaria prevention measures; (6) Malaria prevalence; (7) Health status of the community members.

6.1 Malaria-related Knowledge of CDDs and PMVs

CDDs and PMVs in both Anambra and Gombe States were asked several malaria-related questions to determine their knowledge about malaria. The table below contains (1) what percentage of CDDs and PMVs knew that people could protect themselves from malaria by using mosquito nets; (2) what percentage of CDDs and PMVs knew that ACT was the best way to treat malaria.

Anambra	(1) Know Mosquito Nets		(2) Know ACT	
State	CDD	PMV	CDD	PMV
Baseline	93%	93%	66%	77%
Follow up	98%	98%	99%	94%

From the results above we can find that for both CDDs and PMVs, their knowledge about the mosquito nets and ACT medicine was largely improved. Nearly all the CDDs and PMVs knew that mosquito nets could protect people from malaria and ACT was the best way to treat malaria when the follow-up survey was conducted. The result is quite inspiring and positive, indicating that the average knowledge on malaria of CDDs and PMVs at endline was improved compared to the situation at baseline. The results may due to a combination of the implementation of the project and some other factors.

6.2 Malaria Diagnosis Measures by CDDs and PMVs

RDT was recommended to use in facilities where laboratory facilities or personnel are not available, and both CDDs and PMVs were trained how to use RDT. Thus, the

survey asked both CDDs and PMVs (1) whether they used RDT to diagnose their last patient with fever; (2) If they had RDT available at the time of the interview. The results are as follow:

Anambra	(1) Whether used RDT		(2) RDT availability	
State	CDD	PMV	CDD	PMV
Baseline	5%	3%	9%	5%
Follow up	72%	4%	52%	6%

From the above results, we can find the that things were quite different for CDDs and PMVs. For CDDs, both the use of RDT and availability of RDT in the follow-up survey were significantly improved comparing to the baseline survey. However, the two indicators almost stayed the same for PMVs. The reason behind this phenomenon might be that the Nigeria government only allowed the CDDs to store RDT and use RDT to diagnose malaria. The government forbade PMVs from storing and using RDTS even thought they received the same training with CDDs on RDT use through the MCBP training program. This policy carried out by Nigeria Government tremendously limited

the use of RDT among PMVs, and this was probably the main reason why we can observe a significant gap between the situation for CDDs and PMVs.

6.3 Malaria Treatment Measures by CDDs and PMVs

ACT was recommended to use for malaria treatment, and both CDDs and PMVs were trained to treat patients having fever with ACT appropriately. Thus, the survey asked both CDDs and PMVs (1) whether they treated their last patient with fever using ACT; (2) If they had ACT available at the time of the interview. The results are as follow:

Anambra	(1) Whether used ACT		(2) ACT availability	
State	CDD	PMV	CDD	PMV
Baseline	31%	61%	15%	74%
Follow up	78%	83%	45%	78%

From the results above we can find that for both CDDs and PMVs, the use of ACT and availability of ACT improved a lot. However, the ACT availability for CDDs in the follow-up survey was much lower than the three other indicators. To promote ACT use, Nigeria Government carried out different policies for CDDs and PMVs. Nigeria

Government provided free ACT to CDDs and asked them to distribute the ACT to patients with fever for free. On the other side, due to the nature of a free market, Nigeria Government cannot ask the PMVs to sell ACT as the only anti-malaria medicine. Thus, they provided subsidized ACT to PMVs in order to encourage them to sell ACT rather than other medicine. The difference between the polies applied to CDDs and PMVs may be one of the main reasons why CDDs in the follow-up survey had relatively lower ACT availability rate than PMVs on average.

6.4 Malaria-related Knowledge of Community Members

In order to know to what extent the community members know about malaria, the project conducted a household survey. The survey asked community members the following 4 questions: (1) Whether they knew the danger sign of malaria is fever; (2) Whether they knew the most vulnerable groups include pregnant women; (3) Whether they knew the most vulnerable groups included children under 5 years old; (4) Whether they knew ACT was the best way to treat malaria; (5) Whether they heard of RDT. The results are as follow:

Anambra State	(1)Danger sign is fever	(2)Vulnerable group: Pregnant women	(3))Vulnerable group: children under 5	(4)ACT is the best way to treat malaria	(5)Heard of RDT
Baseline	79%	9%	28%	18%	21%
Follow up	83%	22%	45%	38%	27%

From the table above, we can find that for all the 5 questions, the correction rates increased largely, indicating that the community members' knowledge on malaria was improved by a large scale. However, not all the numbers in the follow-up survey are satisfying. For example, the percentage of people who knew correctly the most vulnerable groups to malaria was less than 50%. Similarly, only less than half of community members knew ACT and RDT. Therefore, more efforts should be made to improve the knowledge of malaria among the community members. The CDDs and PMVs should provide more instruction and education about malaria prevention, diagnosis and treatment to their community members through all kinds of campaigns.

6.5 Malaria Prevention taken by Community Members

To understand what measures the community members took to prevent

themselves from malaria, some questions regarding Mosquito Nets were asked with a focus on the most vulnerable groups of population, pregnant women and children under 5 years old. The questions included (1) Whether community members knew sleeping under mosquito nets can protect themselves from malaria; (2) The percentage of households with at least one mosquito net; (3) The percentage of children under 5 years old sleeping under mosquito nets; (4) The percentage of pregnant women sleeping under mosquito nets. The results are as follow:

Anambra State	(1) Mosquito nets can prevent malaria	(2) % of household with at least one net	(3) % of children sleeping under a net	(4) % of pregnant women sleeping under a net
Baseline	76%	62%	39%	45%
Follow up	90%	90%	58%	57%

From the table above, we can find that all the four indicators increased a lot, which means that more and more community members prevented their families and themselves from malaria by using the appropriate method. However, the percentage of children under 5 years old and pregnant women sleeping under a mosquito net were still

surprising low. Only about half of them were actually under effective protection. The program should make more efforts to promote the use of mosquito nets and other prevention measures among the most vulnerable population.

6.6 Malaria prevalence

The malaria prevalence can be measured through the RDT positive rate. The table below contained the percentage of population with 3 different groups who had a positive RDT result.

Anambra State	(1) RDT positive rate for children under 5	(2) RDT positive rate for children between 5-12	(3) RDT positive rate for pregnant women
Baseline	5%	10%	10%
Follow up	8%	15%	30%

From the table above, we can find that both the three indicators increased, which seemed to indicate a higher malaria prevalence among children and pregnant women. However, some more factors need to be considered when drawing the conclusion. From 6.2 table we already knew that the RDT use increased a lot among CDDs. As a result, more patients were supposed to be diagnosed by RDT, and the RDT positive rate were

expected to increase even though the true malaria prevalence stayed the same as before. Therefore, we cannot conclude if the malaria prevalence increased or decreased only through the RDT positive rate. More information should be taken into consideration to draw an accurate conclusion, such as fever rate and self-reported malaria rate.

6.7 Health Status of Community Members

Health Status can be measured by (1) underweight rate and (2) anemia rate. Usually in the areas which has more severe malaria problems, the two indicators tend to be lower. Thus, we can evaluate whether the malaria was better controlled and whether the current public health situation was improved by comparing the health status data from the follow up survey to the data from the baseline survey.

Anambra State	(1) Underweight Rate among children under 5	(2) Anemia Rate among children under 5
Baseline	14%	45%
Follow up	17%	14%

From the table above, we can find that the underweight rate among children under 5 increased slightly, while the anemia rate among children under 5 years old decreased

largely. This results indicate that the health status of children was improved in some aspects. However, the situation in some other aspects was not positive. There are some possible explanations for the poor performance on underweight rate. Firstly, some other issues, such as poverty, lack of food and water, can also be strongly associated with underweight rate. Thus, even the malaria was controlled, the underweight rate may still stay the same or even increase due to the existence of other issues. Secondly, the program cannot address the underweight problem at a relative short time period. The follow-up survey was conducted only one year after the baseline survey, but the effect of the program on underweight rate may need longer time to show up.

VII. Discussions and Conclusion

The above 7 tables show that in most cases, the malaria prevention and treatment situation was improved during the process of the program. The interventions implemented in the program might be one of the factors leading to the improvement. This result is aligned with the previous research, which considers community treatment as a

feasible way to control malaria and other public health diseases. However, some of the results are now satisfying enough, such as the RDT use among PMVs and underweight rate among children under 5 years old, which indicates some potential policy adjustment can be made in the future by both the Nigeria Government and the MCBP Project. Moreover, the data above can only reflect a small part of the situation in Nigeria after the program was ran. Although a lot of data was collected from the project by the World Bank, this paper only used some of them, with a focus on the core indicators of interest. If more data can be used and analyzed in this paper, the conclusions can be more comprehensive. In addition, during the process of implementing the two interventions, no effective supervision was conducted. For the CDDs, their activities were supposed to be monitored by the project but no monitoring or supervision visits were made due to lack of funding. There were some supervisory visits but those were limited to World Bank supervision missions. For the PMVs, the project did not carry any supervisory or monitoring visits due to lack of funding except for World Bank supervision missions. Therefore, the results of the interventions may be negatively affected due to lack of

enough supervision.

To improve the effect of the CDI and PMV interventions, the Nigeria government should allow the PMVs to use RDT as long as they receive training on how to use it. The World Bank should provide more funds on monitoring and recording the work of CDDs and PMVs. The project team should emphasize the importance of RDT in the training program and encourage both the health workers and patients to believe the results of RDT.

Apart from Nigeria, WHO has also identified another 96 countries and territories as high-intensity transmission areas, most of which are in sub-Saharan Africa, Asia and Latin America. The CDI and PMV interventions discussed in this paper can also be used, or at least worthy of consideration, in these areas if they have similar social structure to Nigeria's. In Nigeria, most people share a strong attachment to their family and community. In most cases, the community members know each other very well, and the community leaders enjoy a great reputation and influence in their community. Under this situation, the community-based interventions can be an effective way to address malaria

and other public health problems, especially when the public sector alone cannot deliver sufficient prevention, diagnosis, and treatment services to the population. The National Policy on Malaria Diagnosis and Treatment defines Community Management of Malaria (CMM) as “a strategy by which cases of malaria can be recognized, using basic symptoms with simple diagnostic tools where available and treated promptly within the community.” This is consistent with demographic and public health literature, which has identified community-based and family-based approaches as a key factor in improving health even under very poor economic conditions.

Although many countries have already implemented community-based interventions to fight against malaria, such as Bhutan, Colombia, Tanzania, Rwanda and Kenya, the CDD and PMV interventions are still meaningful for the remaining high-intensity transmission countries and territories. Previous studies have demonstrated in which parts the community-based interventions can take effect and in which parts they cannot. According to the experience gained from Zambia, Community Health Workers (CHW) were able to manage malaria fevers by correctly interpreting RDT results and

appropriately prescribing antimalarial. Besides, they also showed ability to manage the stocks of commodities. However, the CHW cannot appropriately refer the non-malaria patients for treatment unless more efforts were made to integrate community-based interventions with primary health facilities. (Chanda, Hamainza, Moonga, Chalwe, & Pagnoni, 2011) Besides, experience gained from Uganda also showed that if the support of communities and health system falls short, the community health workers cannot operate sustainably. (Banek, et al., 2015) Therefore, in the future programs where community-based interventions are to be implemented, great efforts would be needed to strengthen the corporation between community-based actions and the primary health system.

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